Soaring Association of Canada

INSTRUCTOR POCKET BOOK

2011 January

....
Name

....
Address

....

....

SOARING ASSOCIATION OF CANADA

INSTRUCTOR POCKET BOOK

INDEX

FLIGHT TRAINING & SAFETY COMMITTEE

Revised and re-issued from the original Instructor's Air Notes 2003 April;
Minor wording changes made in the introduction in 2005 December.

Reference Documents:

SOAR and Learn to Fly Gliders, the Soaring Association's student glider pilot manual, 2007 January and *Soaring Instruction Manual,* the Soaring Association's instructor guide, 2010July.

INTRODUCTION

This Pocket Book is the shortened version of the Instructor Handbook. This Pocket Book should only be used in the air when the instructor is thoroughly familiar with the more detailed notes in the Handbook, and has been instructed in and has satisfactorily demonstrated competence at performing all the lessons. This book replaces the previous Instructor's Air Notes.

Changes in words and designations are designed to improve the teaching of the exercises and to facilitate better and safer piloting. In particular we introduce in these instructor books changes to the teaching of the circuit, the stall and spin, the latter two to emphasize avoidance of stalls and spins.

The wording for the points in the circuit is now **High Key Area** compared to the initial point, or Goal # 1, used previously. The word Key is used to denote a critical *decision point*. The downwind leg starts after the high key area and ends at the **Low Key Point** (previously Goal # 2) at between 500 and 600 ft agl when opposite to, or abeam the **Reference Point – RP –** that was previously called the aiming point. This is still the point at which the glider would hit the ground if it were not rounded out. The change in name is to avoid the tendency of pilots to aim the glider by pointing at the ground using the elevator. They should instead correctly use the airbrakes to adjust the glide path at a constant approach speed.

The standard circuit pattern has been revised to include a **diagonal leg** that cuts off the corner between the downwind and base legs. If flown properly, it is considered a safer pattern for gliding operations in general when compared to the rectangular pattern. It has now been adopted into the Association's training manuals. (This circuit is becoming or is already the standard in several European countries). At some gliding sites this modified circuit may not be practical.

The instructor will be transferring responsibility gradually to the student throughout his or her training. A suggested sequence or guide for each flight is given in the notes for the first several lessons. These guides specify who performs which function, e.g. instructor in control and gives demonstrations, student following through or not, followed by student given control to practice while instructor prompts and monitors. During later flights we expect the student to be performing all functions, so we suggest no particular sequencing. Instructors must be aware of how the student has progressed, ensuring basic skills have been grasped before adding new skills in subsequent lessons.

A number of smaller exercises were added to the curriculum in 2003. These will help students to advance quickly by being taught in a logical sequence. All recommended exercises are listed in the **Pilot Training Record – Gliders (PTR)**. Notes are included in this and the instructor's manual for the instructor's guidance to judge when the student would be ready to proceed to the next exercise or lesson. This is important, for example, when first trying the aerotow or the

approach and landing, when starting either Stage too early can unnecessarily stress the student and slow progression.

Modern gliders will have their airspeed indicator marked with a bug at the minimum recommended approach speed. This should be followed and used for zero wind conditions, adding extra speed for light and stronger winds as appropriate, according to the formula:

Approach speed = 1.3 Vso + Vw
Where Vso is the 1g stall speed, and **Vw is the max wind or gust speed.**

As is now the practice, this approach speed to fly should be adjusted at the A – Airspeed item in the pre-landing **SWAFTS** checklist. The speed should be no less than 45 knots (50 mph) or less than the bug speed shown on the ASI. Pilots must be taught to adjust to local conditions such as at wave sites that require special caution. In all cases, whenever a pilot flies another glider for the first time he or she must also be taught to refer to the pilot operating handbook or flight manual for that aircraft.

Following this introduction, the recommended sequence for the flight training up to first solo is given in a list of the lessons and exercises to be included at each stage and thus the progression from one stage to the next. The list is included in the student's PTR. Most importantly the list shows skill requirements or pre-requisites that should be reached before the next lesson or exercise is taught. For example, for sideslipping at Stage 13, more than one flight will be needed to achieve an acceptable skill level. All instructors should be familiar with and follow this sequence. We must realise that only an exceptional and persistent student may be able to complete the training satisfactorily in a minimum number of about 30 flights. Most student pilots would be expected to take more than this to solo, and this will depend of course on many factors such as the pilot's initiative, age, frequency of flying, and of course the consistency of instruction. It is more important to remember that it is the exercises that have to be completed and the relevant skills acquired before first solo, not a set minimum number of flights!

Comments are always of use and interest to the Flight Training and Safety Committee. If you have some, please contact any committee member.

If an instructor finds the material in this Instructor Pocket Book insufficient to fully cover the intended exercise, he or she should refer to the Instructor Handbook.

RECOMMENDED SEQUENCE FOR TRAINING PROGRAM TO FIRST SOLO

Pre-requisites are shown in square brackets in the table on the next two pages. The student pilot should achieve the skill levels shown in these brackets before the new skills are taught at that Stage. All students should practice each exercise or skill after it is first demonstrated. This must extend into several subsequent flights. For clarity this is not shown in the detailed listing below.

The numbers representing the different skill levels are shown below. The relevant number is to be shown in the student pilot's training record book, the PTR, for each exercise taught and practiced. This shall be done for all dual and pre-licence solo flights.

Skill levels:

1. Preparatory Ground Instruction and Demonstration; Instructor had to take control for Safety reasons;

2. Student able to perform manoeuvre with physical (& verbal) assistance;

3. Student able to perform manoeuvre with only verbal assistance and the manoeuvre contains non-critical errors;

4. Student able to perform manoeuvre with no verbal or physical assistance with only non-critical errors, i.e. only minor deviations from the standard;

5. Student Flying Standard – Satisfactory for Solo*; manoeuvres flown with precision, no assistance, only minor errors, no major judgement or decision-making errors.

*Based on document *SAC Standard for Solo*

NOTE

Exercises marked* in the following table may be postponed to the post-solo stages. If pre-solo training was compressed the dual flights should be more frequent after solo to cover all the missed exercises before licensing.

Stage #	Skills and Lessons	Prerequisites
Famil.	Instructor introduces CISTRSCO and LOOKOUT.	
1	Demo Interior and Exterior Inspections; Demo CISTRSCO and LOOKOUT; Primary Effects of Controls - Elevator, then Ailerons (and Rudder) to perform Gentle Turns entry and exit; Control of Speed	
2	Aileron Drag; Continuous Turns; demo SOAR technique	
3	Stability; primary Effect of Rudder; The Trim; SOAR Continuous Turns; Demo SWAFTS (including radio call)	
4	Reduced-g; Slow Flying; 1g Stalls; Turning onto a Heading; SOAR, SWAFTS.	
5	Medium Turns Thermalling Technique and Protocols Straight Flight (towards a reference point on horizon)	[Effects of Controls & Turn Coordination – 3]
6	Demo Takeoff and Aerotow/Winch Launch Effects of Airbrakes at height Approach Control using Airbrakes, and Overshooting and Undershooting; Demo Landing	[Medium Turns – 3] [Speed Control – 4 & Straight Flight – 3] [Effects of Airbrakes – 3]
7	Practice Takeoff and Tow/Winch launch Turns; Lookout, Straight Flight; Stalls; etc. Approach and Landing (from high Final Turn) Thermalling*;	[Medium Turns – 4] [Medium Turns – 4; Effects of Airbrakes – 3] [Overshooting & Undershooting – 3]
8	Steep Turns & Advanced Thermalling* Demo Circuit Planning Practice Approach and Landing	* see page 3 [Approach and Landing – 3]
9	Steep Turns, Thermalling* Demo and Practice Collision Avoidance Flying the Circuit (normal Final Turn Height); Use of Radio	[Medium Turns – 4]
10	Spiral Dives and Benign Spiral* Zigzag in Downwind exercise(optional)	[Steep Turns – 3] [Circuit Planning – 3]
11	Boxing the Slipstream; Low Tow; High Tow Further Stalling exercises (Climbing, Descending, and in a Turn)	[Aerotow – 3] [1g stalls – 3]
12	Rope/Cable Break Recovery Technique at altitude Effect of Angle of Bank on Stall Speed	[Further Stalling – 3]

13 Slack Rope on Aerotow
Rope/Cable Break Recovery practice at altitude
Sideslipping at altitude exercises
Abbreviated Circuit [Circuit Planning – 4]

14 Tug Upsets & Emergency Aerotow Procedures
X-Wind Takeoff; Laying Off for Drift on Winch
Sideslipping & Sideslip on Approach [Sideslipping – 3]
Illusions created by Drift; X-Wind Landing

15 Descending on Tow* [Aerotow – 4]
Spins – Comparison to Spiral Dive [Spiral Dives – 3]
Airbrakes fully open before Circuit exercise
[Circuit Planning – 4]

16 Further Spinning exercises*;
Changing Effect of the Rudder at the Stall;
Spin Left off a Right Turn, from *Pear Turn*, etc. [Spins – 3]

17 Spins Avoidance Practice* (recover before spin develops)
Instruments covered exercise*
Right-hand Circuit exercise

18 Rope Break demo at 500 ft + agl
[Rope/Cable Break Recoveries – 4]
Abbreviated Circuit [Abbreviated Circuits – 3]

19 Off-field Field Selection and Circuit Planning

20 Rope/Cable Breaks flights (demo first at lift-off, at low height, at medium height (300 ft agl), then student practice with full briefing before each flight) [Rope Break demo at 500 ft – 1]

21 Review and Practice all manoeuvres and skills

22 First Solo flight [All identified exercises and skills – 5]

23 Post-Solo: [dual flight after every 4 flights max.] Review basic manoeuvres, upper air work, incl. descending on tow, Slipping Turns, etc

24 Upper air work: Post-basic training exercises, Review of flight test elements

25 Upper air work: Review spins and spin avoidance, slips, etc., advanced thermalling, etc., off-field field and circuit selection

26 Flight test review and recommendation
[All exercises and skills - 5]

FAMILIARIZATION FLIGHT

1) **INSTRUCTOR** demos CISTRSCO.

2) **WITH AB-INITIO STUDENT**: Point out landmarks, airfield, etc., outside cockpit; Student operates release; introduce LOOKOUT; Allow student to try controls; include protocol for who has control. Mention operation of air brakes, and briefly describe landing.
3) **WITH POWER PILOT**: Explain difference in controls & instruments, noise/no vibration; Allow him to handle controls in free flight; emphasize importance of LOOKOUT because of frequent close proximity to other gliders; Describe operation /use of air brakes; compare to throttle; Describe landing procedure and flare much closer to the ground.
4) **INSTRUCTOR** Approach, Land and Roll Out. Review flight.

COCKPIT CHECKS

On ALL flights instruct all students to perform:
1) **Exterior**, **Walk-Around** check for damage, tail dolly and control locks; and **Interior** inspection for seat adjustment, ballast. Go over hooking up procedures, ground signals, wing running, etc;
2) **CISTRSCO*** checklist; O - Options item to include emergency actions low down following possible premature launch failure*;
3) After release, perform **Post Release Check**: call "rope/cable gone", turn right, adjust speed, raise wheel, re-trim, and confirm airfield location.
4) Prior to stalls, spins, etc., **CALL** check,
5) Pre-landing **SWAFTS** check;
6) Emphasize **LOOKOUT** and **SOAR** techniques throughout all flights; emphasize need to avoid distractions, e.g. setting GPS;
7) Use sightings of aircraft close by to discuss **collision avoidance**.

Note * Before first flying lesson, discuss some of the factors that dictate decision-making needed immediately following a premature launch interruption, such as wind direction and strength, landing areas available immediately on/off the airfield, obstacles, alternative options and actions for release and launch interruptions. This also will be taught throughout the flying course. Mnemonic **WROLL**.

CONTROL EFFECTS - 1
& COORDINATED GENTLE TURNS

1) Instructor demonstrate **Exterior** and **Interior** inspections, also ALL ground and launch signals.
2) Instructor to perform **CISTRSCO** checks, ensure runway is clear of hazards, then take off and tow. Student does **NOT** follow through.
3) **LOOKOUT**. Teach how to scan during first tow; include searching **above** and down to the horizon ahead at end of scan.
4) Student to look at rope, pull release, when visually confirmed call "rope gone," turn right, adjust speed (do NOT teach climbing turns), level the wings, raise the wheel, re-trim, and confirm location of the airfield.

5) **ELEVATOR controls PITCHING**. Instructor to demonstrate, then Student to try this **effect of the elevator**.

6) **CONTROL OF SPEED**
a) Demo effects of different attitudes on speed, student to watch ahead and for the new attitude, read ASI;
b) Student to fly, lower nose and hold new attitude, note ASI, also note the glider takes some time to increase its speed [slow response because of glider's inertia].
c) Demonstrate attempts to control speed using ASI only.

7) **PRIMARY EFFECT OF RUDDER - RUDDER controls YAWING** Student follows through on rudder pedals only;
Apply rudder one way for a few seconds only; emphasize that **the glider does not turn**. Note yaw string shows slipping;

8) **COORDINATED GENTLE TURNS - AILERONS control roll**
a) LOOK OUT first, then demo use of **stick** and **rudder** to enter turn;
b) Stop the rolling using stick and rudder together, then
c) Control the angle of bank, and the pitch attitude;
d) To roll out of the turn, look **under the high wing** then **ahead**, if all clear, level the wings using stick and rudder together.
9) Student to fly as much as possible. Do NOT discuss circuit planning. Introduce **SOAR** and **SWAFTS**; Instructor to take over control at **Low Key Point**.
10) **REVIEW FLIGHT** after landing and roll out.

CONTROL EFFECTS - 2
AILERON DRAG & MORE TURNS

1) Student does CISTRSCO, instructor supervises; instructor does takeoff and tow. On tow develop student's height judgement and lookout technique; review topographical features near club. Teach the **rules of the air** and methods to avoid other aircraft.
2) Student performs LOOKOUT, looks at rope, releases, calls "rope gone", then instructor turns right, adjust speed, raises the wheel, then re-trims (see page 9); student confirms location of airfield.
3) **LOOKOUT.** Take control if student forgets, then re-start exercise.
4) **AILERONS control ROLLING**. Review this primary *effect of controls* now, student **follows through** during this and next demo.
5) **AILERON DRAG**; Choose a horizon reference point ahead;

a) Move **stick only** to left, glider's nose (initially) yaws to right; this is ADVERSE YAW caused by aileron drag; **
b) Repeat showing effect of using the controls correctly to avoid adverse yaw. **Demo only; student should **not** practice, see notes on page 9.

6) **MORE ON TURNS;** the student to **follow through** demo of the three stages: rolling in, staying in and rolling out; maintain good **lookout.** Before rolling out of the turn, perform good lookout in areas ahead, above, to both sides, and under the high wing; Direct the **student to practice** a series of turns as below.
7) **STRAIGHT FLIGHT**. Use a series of shallow coordinated turns to fly towards reference point on the horizon, using ailerons and rudder together; limit change of direction to about 30^{o} either side.
8) **PRE-LANDING CHECK**. Introduce student to the pre-landing checklist before arriving at the **High Key Area**. Demonstrate a quick and efficient **SWAFTS** checklist.
9) Allow student to fly as much as possible, but DO NOT discuss circuit planning. Instructor to take over control at **Low Key Point**, approach and land;
10) **POST-FLIGHT REVIEW**. Review important points first; Rules of the air and collision avoidance. Also ASI, incl. errors, and pitot/static ports. Ask for feedback and leave student in a positive frame of mind.

STABILITY, The TRIM & FURTHER EFFECTS of CONTROLS

1) Student does **CISTRSCO**; Instructor takes off and tows. Develop student's lookout technique; indicate other aircraft. Before release direct student to perform lookout, etc, as in item 3) on page 7.
2) **STABILITY**. **Directional stability** - Instructor **demonstration only**. Student does **NOT** follow through or practice; see Note 2 below. **Pitch Stability** – Fly in normal gliding attitude with glider trimmed; student **follows through,** then **student to practice** this.
3) **THE TRIM**. S**tudent to fly** in the normal gliding attitude. For each change of attitude/speed, teach how to re-trim the glider.
4) **FURTHER EFFECTS OF RUDDER**. Instructor **demo** only. Apply rudder only, initial roll caused by more lift on one wing; continues to roll because of the glider's lateral stability or *dihedral*.
5) **FURTHER EFFECTS OF AILERONS/BANK.** Instructor **demo** only. This is a subtle effect and to be demonstrated well, needs very still air.
6) Student to practice turns, and use of **SOAR** to decide when to return towards airfield; practice **SWAFTS** checks. Start well before the **High Key Area** at first – aim for efficient and quick checklist.
7) **PRE-LANDING**. Student fly in circuit as prompted, instructor approach and land. Instructor **demonstrates radio call** at **T**raffic item in SWAFTS checklist. Student to practice on the ground.
8) **POST-FLIGHT REVIEW.** Briefly review the *stabilities* and *collision avoidance*, and discuss the student's flying practice.

NOTES to Instructors

1. Note that only directional (or yaw) and pitch stability are covered in the previous lessons. Lateral stability is difficult to demonstrate in a simple rolling motion, so discuss this effect on the ground!
2. The student should not be asked to use a single control by itself any longer than needed to feel its effect, e.g. to repeat the aileron drag demonstration. This avoids developing the bad habit of NOT coordinating all three controls together (note – law of primacy).

UN-ACCELERATED STALLS

& RECOVERY, SLOW FLYING

The stalls are to be un-accelerated or 1*g* stalls; objective is to recognise the symptoms, how to recover and then to avoid stalling. Height must be above specified minimum after recoveries. C of g must be within limits. Ballast to be adequately secured for **all** conditions, incl. **negative** *g* loads.

1) Student does **CISTRSCO**; instructor takeoff and tow/launch. Balance of tow see 3) and 4) on page 7.

2) **REDUCED-*G* SENSITIVITY.** Instructor demonstrate **CALL** check. Describe exercise as you do it. Student does **NOT** follow through.

a) From normal gliding attitude, lower the nose to about 15° nose down (if student reacts very adversely to this, stop the exercise);
b) Continue the *pushover* to about 30° nose down; watch student;
c) Pull up into a climb, then pitch down to the normal gliding attitude as speed drops.
d) Under reduced-*g* the glider is flying; it is not stalled, and the first pushover **can be stopped at any time**; relate the feeling to that of *falling* at the stall, which cannot be stopped until the glider has regained speed.

Eventually get student to do the manoeuvres, to assist desensitizing. Make note in the PTR for other instructors.

3) **SLOW FLYING**

a) Student to follow through initially during demo of the **symptoms** of the approaching stall; airspeed reduces, noise changes, note changing response of the glider to the controls, extra back-pressure needed on stick to hold nose up (student to feel this force);
a) Continue to fly slowly **using all controls normally**; note the nose-high attitude and the speed at which buffeting is felt;
b) To recover to normal flight, lower the nose, check the ASI reading (is it increasing?) and look ahead to the horizon and return to the normal gliding attitude.

Student repeats for each symptom, identifies each symptom, then recovers to normal gliding attitude in each case.

4) **UNACCELERATED or 1G STALL**. Student does not follow through on initial demonstration – perform CALL check;

a) Raise the nose slightly above normal (make sure it does drop);
b) In spite of attempts to hold nose up (touch elevator against the stop and mention this), the nose drops; note ASI reading at the stall;

c) To recover, *lower the nose*, check the ASI reading, look ahead to the horizon and return to the normal gliding attitude; note height lost.
d) Repeat and allow/make one wing to stall first - comment on it - recover as before, then level wings **but only after** speed increases above stall speed;
e) Student repeats above stalls and recoveries.

NOTE: watch **Power pilots**; they are likely to push the stick fully forward when recovering unless carefully briefed!

5) **STALLS in a TURN.** Perform CALL check.
a) Repeat 4) above but with the glider in a typical gentle turn, again without and with a wing drop.

6) **MUSHING STALL**. Student may be talked through this exercise. Note high sink rate when mushing.
c) Raise nose slightly above normal as to reduce speed, but so that nose does not drop;
d) Ask student to identify each symptom as it is noticed;
e) This is a *mushing* stall; the nose does not pitch down;
f) Recover to the normal gliding attitude as before.

6) **STALL** with **AIRBRAKES** or **SPOILERS open**
a) Note symptoms of the stall, and higher stall speed;
b) Recovery to include closing brakes/spoilers.

7) **BALANCE OF FLIGHT**
a) Practice rolling into and out of turns with *stick and rudder together*, gradually working up to 30º bank angle;
b) Keep student looking out, during and prior to all turn entries and exits.

8) **SUBSEQUENT FLIGHTS**

Take every opportunity to perform stall recoveries emphasising stall avoidance. Useful exercises are to practice slow flying and gentle turns, note pre-stall symptoms but avoid a full stall.

9) Instructor plan circuit, student fly in the circuit as far as *low key* point, instructor take over control for rest of circuit and landing.
10) **POST-FLIGHT REVIEW**. Go over the stall recovery sequence and importance of unstalling wings as the first essential action. Include a review of the **compass**, how to swing and use it, and its errors.

NOTE: See also **Further Stalling Exercises**, on page 32.

MEDIUM TURNS & THERMALLING

1) Student performs **CISTRSCO**; Instructor take off and tow. Student to do lookout and release, then take over control and do checks.
2) Major objective is to produce pilots to make medium turns (30 - 45°) briskly and with conviction/confidence.
3) Before turns exercise, perform **lookout –** scan to *both* sides, then *above* and to the front. Faults in turns often start from inaccurate flying; start from a well-balanced straight and level attitude.

4) **ROLLING INTO TURN**: Look ahead to point on horizon; * increase speed slightly (from now on always teach the student to lower the nose slightly for all turns). Then roll firmly to about 30° angle of bank.
5) **STAYING IN**: Look to horizon to judge and control angle of bank; Maintain a good **lookout;** avoid looking down; keep speed constant by maintaining pitch attitude, re-trim to remove backward stick force.
6) **ROLLING OUT**: Look around for other aircraft, including **under** the high wing, look ahead then roll out of the turn; ease off backpressure on the stick, and when flying straight and level, re-trim.

*** NOTE:** Judge rudder input when rolling into a turn by watching for *adverse yaw*. Not enough rudder input, nose yaws away; too much rudder and yaw starts before the glider rolls.

7) **FAULTS IN MEDIUM TURNS**

a) Failure to perform adequate **lookout**; immediately take over control to prevent the turn. Complete the lookout, then turn.
b) Slow rate of roll; can lead to poorly coordinated turns that are potentially dangerous.
c) Angle of bank varies; judge by reference to angle between the horizon and the top of the instrument panel or cockpit sides;
d) Angle of bank increasing or decreasing; need to recognise these; also avoid **juddering** the glider round the turn as bank decreases.
e) Speed increases (nose drops) because of insufficient backpressure or nose-up trim. Refer to pitch attitude relative to horizon.
f) Over or under-ruddered turn entry; See above note to instructor to correct this fault. Incorrect rudder is indicated by yaw string.

g) Check slip or skid by reference to yaw string or ball. It is negative learning to learn to ignore the yaw string.

8) **THERMAL ENTERING** exercise (joining other gliders)
a) Approach thermal from the side on a tangent to the circle in same direction of turn as other gliders; position the entry to be opposite the other glider; maintain visual contact with all other gliders; it is safest to enter an occupied thermal from below or above;
b) Emphasize LOOKOUT needed for **collision avoidance**; see also **Notes** about collision avoidance on page 31.

9) **THERMAL CENTERING** exercise
a) Look around scanning both sides and above; to enter an unmarked thermal, as rising air is entered judge which wing rises first;
b) Start turn toward centre of thermal in strongest lift.
c) To centre thermal; when variometer reading increases level the wings; After 2 - 3 seconds resume previous angle of bank; Repeat as necessary during the climb to stay in the centre of the thermal.

10) **MAINTAINING SEPARATION** in thermals exercise
a) Adjust turns so as to maintain visual contact with other gliders;
b) Maintain a continuous lookout above, below and as far as possible around to both sides of the glider;
c) If sight is lost of another glider, leave the thermal briefly.

11) **FLYING STRAIGHT** coordination exercise - practice coordination in a series of turns to fly (straight) towards a point on horizon and compass heading.

12) **BALANCE OF FLIGHT.** Student performs SWAFTS checks well before entering the **High Key Area** and then flies in the circuit. The instructor takes over control at the **Low Key Point**.

13) **POST LANDING**
a) Review all items of the flight;
c) Pilot responsibility for glider remains until next pilot takes over. Stress importance of ground handling in winds; airbrakes open, canopy closed, and locked; if necessary chock the glider to prevent rotation, or tie it down properly.

EFFECTS OF AIRBRAKES, FLYING THE APPROACH

1) Student performs **CISTRSCO**, search area **ahead and above**. Instructor **demo takeoff and aerotow** student to follow through.

2) **EFFECTS OF AIRBRAKES** exercise at altitude

a) **CALL** check; **Instructor takes over control**; Student opens and **identifies** (looks at) airbrakes and handle/lever; note changes in pitch, rate of descent, and the forces needed to open and close the brakes.

b) **Student now flies** and maintains speed from brakes closed to half open, checks visually against position of lever; opens brakes fully, then closes and locks brakes.

c) Repeat at higher speeds including close to manoeuvring speed; after this exercise, student to practice use of airbrakes on the approach, instructor prompting. **Don't** discuss circuit planning at this stage.

d) Instructor demo landing – see page 16, student follow through.

3) **APPROACH CONTROL** and **UNDERSHOOTING and OVERSHOOTING** exercises.
First complete the above exercise. **Instructor fly** the glider, student following through;

a) Agree on a **Reference Point** as you pass abeam the landing area – e.g. the landing "T" or a mark on the runway;

b) Fly the final turn **higher than normal** to give time for the demo;

c) Demonstrate an **Undershoot** – ask student to note which way reference point is moving against a point on the canopy; Emphasize steady speed and attitude; Repeat for an **Overshoot**;

d) On next flight or two, student to fly long approaches; subsequent flights to be from usual final turn position.

4) **FLYING THE FINAL APPROACH** exercise
This exercise should be demonstrated and then practised after completing the above **overshooting** and **undershooting** exercise satisfactorily.

a) From a high final turn, instructor demonstrate approach at ½ - ⅔ airbrake setting (approximately half effectiveness); student to follow through on controls including airbrakes. Note no apparent movement of *reference point* on canopy; emphasize steady speed and attitude;

b) Using a longer than normal approach allow student to practice flying the approach using airbrakes to control descent rate/glide angle, and elevator to control speed;
c) If final turn is made to one side of runway centre-line or chosen landing line, correct this early on the approach;
d) On later flights student to make final turn at correct position;
e) From a low final turn but at usual position, ensure student does not use airbrakes early, i.e. before establishing an overshoot or before intercepting the usual ½ - ⅔ airbrake approach glide path.

5) **POST FLIGHT REVIEW**

Remind the student of the need to keep the hand on the airbrake lever, when opened, to avoid them being sucked open further; the need to coordinate with the elevator and to monitor the speed more frequently, and the need to use the brakes if at any time the speed is accelerating through Va, the maximum manoeuvring speed.

PROBLEMS IN APPROACH CONTROL

1. Too frequent adjustments of the airbrakes. This does not allow time to observe the effects on sink rate while speed is controlled; small adjustments could lead to PIOs.
2. Gradual closing of the brakes just before flaring; power pilots converting to gliders may do this; try to discourage this, except when speed is decaying too rapidly at the flare and a hard landing is to be avoided. Landings are easier at the ½ - ⅔ airbrake setting – during the roundout and float the rate of decay of speed is comparable with a comfortable rate of elevator movement.
3. Need to close the brakes close to the ground indicates poor coordination between elevator and airbrakes or inadequate allowance for the wind gradient. Poor judgement of height close to the ground may also be the problem – get student to look ahead and to the sides (using peripheral vision) as the flare is started, to try and better judge the height.
4. Opening the airbrakes when not needed; i.e. the automatic landing syndrome; get student to recognise an undershoot condition; an overshoot situation **must** be established before opening the brakes on final approach.
5. It is not safe to send students solo if they have not been shown an undershoot or cannot recognise when an undershoot is about to occur.

THE CIRCUIT
Part I LANDING

Only permit a student to attempt a landing when he/she has reasonable handling abilities and control of the glider.

1) Student performs **CISTRSCO** checks, search ahead and above for hazards and other traffic. When student has adequate handling abilities allow him/her to do **takeoff**; debrief takeoff at low height then hand over control for balance of tow; instructor follow thru'.

2) **LANDING**. First demonstrate a flare, hold-off and landing; student to follow through. On subsequent flights, monitor and prompt as needed with student flying. See also # 6 in Notes to instructors below.

3) **THE LANDING** - 3 phases - flare, hold-off, touchdown & rollout.

- The **FLARE**, or ROUND OUT.
  Look well ahead (suggest distance to far end of runway) when nearly ready to land;
  Begin to *flare* by adjusting *attitude* of glider; keep airbrakes fixed (**ideally at** 1/2 - ⅔ **airbrake setting**), check wheel brake is not on.

- **HOLD-OFF** and **FLOAT** (demo correct *attitude* prior to takeoff).
  With attitude being held correctly for landing, **hold-off as airspeed drops**, to allow glider to float. This is a fully held-off landing (or low-energy landing) - main wheel touches the ground just before the tail wheel or tailskid. If the tail touches first that too is OK (though not preferred), the energy is lower and the glider will not bounce into the air after touching down.

- **TOUCHDOWN and ROLLOUT**
  After touchdown, keep attitude constant, wings level; Open airbrakes fully and use wheel brake if necessary to avoid hazards; Keep straight with rudder, and nose wheel or skid off ground as long as possible. Keep into-wind wing low; as wing drops to the ground, centre the stick to avoid aileron damage.

4) **DOWNWIND LANDINGS** (This exercise to be done later in training). A downwind landing may be required, for example following an interrupted launch or when

being caught low with insufficient height to do a normal circuit. Rapid decision-making is needed, as below:

a) Choose reference point on runway for a comfortable approach path, leaving adequate runway length beyond the reference point;
b) Control speed on approach; it tends to increase in the wind gradient;
c) Establish overshoot, then use airbrakes to descend to reference point, and leave as much room as possible on either side of glider;
d) Hold off well, and keep wings level as long as possible;
e) Keep straight to avoid ground-looping tendency, particularly with gliders with the cg behind the wheel (no nose-wheel steering).

NOTES to instructors

1. Judgement of the roundout point depends on the steepness of the approach, the perspective of the landing area, e.g. large grass area versus marked runway, slope or unevenness of the landing area, rate of sink, and control movements required to flare, etc. Height judgement low to the ground is aided by peripheral vision, and looking to the sides provides more detailed height information.

2. After a demonstration landing, **prompt the student's first landings**, as their workload is higher than normal.

3. Encourage the student to **fix the airbrakes** for the last part of the descent, ideally at the 1/2 - 2/3 airbrake approach setting.

4. Students may concentrate on an **obstruction** and will then tend to swing towards it instead of looking along the runway to the intended landing spot or *reference point*.

5. In **strong winds** the approach speed will be higher, therefore the float will be longer following the flare, however the glider may be touched down earlier and at a slightly higher airspeed than in lighter winds. This higher airspeed at touchdown gives better control in gusts or turbulence. Open the airbrakes fully immediately at touchdown to prevent the glider taking off again in a gust.

6. Watch for **rounding out too high**: take over control only if necessary; e.g. for landing; **do not delay taking over until it is too late**. It is better to take over too early than too late. Maintain control to the landing – students often relax and will not be prepared to assume control again under these high-workload conditions.

THE CIRCUIT,
Part II PLANNING

The standard circuit pattern should be demonstrated first with the student NOT following through; he should be fully concentrating on the demonstration. This should be of the circuit that the instructor would wish the student to fly if solo. The **objective** is to arrive at a safe speed and at the right height and position for the **FINAL** turn onto the approach. For reference, a minimum height of 300 feet above ground should be chosen, and this should be judged by comparison to the heights of ground features such as trees or buildings, and their appearance, not by reference to the altimeter!

Note that a safe **alternative** approach path and landing area should **always** be chosen. The selection of the **Reference Point** for landing should allow for an adequate undershoot area. Always admit if your demonstration is not as good as you wished, e.g. height not right. Demo in calm conditions.

1) **THE HIGH KEY AREA** (goal 1)

a) Plan to fly towards ***HIGH KEY area*** when glider descends towards 1000' agl; this area is upwind of the runway and is positioned to permit easy entry to the downwind leg at 800' agl when judged appropriate.
b) Before starting the downwind leg, begin **SWAFTS** checklist. Aim to complete this quickly and efficiently. But keep a **good lookout**;
c) Crosswind leg, if applicable, is flown towards downwind side of circuit.

2) **DOWNWIND LEG**

a) Start downwind leg **500 m** from the runway with sufficient height, usually **800 ft. agl** or higher if the circuit is busy. This leg begins in the high key area and ends when opposite or abeam the ***REFERENCE point***, i.e. at the ***LOW KEY point*** (goal 2). The height at this point should be 500 ft agl minimum;
b) The downwind leg is flown parallel to the runway at best L/D speed, making drift allowances for any crosswind, and flying closer to or further away from away if noticeably high/low; runway appears 45^{o}-30^{o} below horizon under wing tip..
c) Select a Reference Point to allow for undershoot area.
d) Select alternate approach and landing area.

3) **DIAGONAL LEG**

a) After low key point is passed before losing sight of Ref pt, turn approximately 45° to fly a diagonal leg towards the base leg, leaving enough distance to complete base leg;

b) Monitor position and angle to the reference point, and adjust by extending or shortening the diagonal leg or by using airbrakes (spoilers) if necessary to lose any excess height. Note drift in winds and again adjust diagonal leg as needed;

c) Angle to reference point is about 18° below horizon.

4) **BASE LEG**

a) Turn onto base leg perpendicular to runway axis, 500m downwind from reference point.

5) **FINAL TURN**

a) Make a turn toward the runway **300 ft agl**, **500m** from reference point (goal 3);

b) Minimum desired height should be chosen with reference to ground features, not the altimeter. For example, the recommended minimum may be set at three or four times the height of large trees or the hangar roof. Angle below horizon to ref pt 8°.

5) **FINAL APPROACH**

a) On FINAL approach note glide path with respect to reference point, and establish **overshoot** condition first, then open airbrakes as needed, and recheck glide path;

6) **POST-FLIGHT REVIEW**

First review the circuit demonstration and any aspects of the demonstration that were not as good as desired, and ask for the student's evaluation of the circuit and the decisions, etc. Then review the other exercises practised on this flight.

THE CIRCUIT
Part III FLYING THE CIRCUIT - 1

For first attempts to plan and fly the circuit discuss and assist the student. Use **SOAR**. Choose best position for the **high key area** considering winds. Make landing decision & plan to arrive in high key area at 900 - 800 ft agl. Start **SWAFTS** check before high key area.

1) **HIGH KEY AREA.** Assess **height**, **distance** and **angle** to the landing area; Turn only in same direction as planned circuit when in this area if safe; choose *reference point* & *alternate landing area*; monitor vario, & lookout for aircraft joining circuit including above and below.
2) **DOWNWIND LEG.** Start at 800' agl and fly at best L/D speed; look out for traffic approaching crosswind, ahead & below, correct for drift with crab;
3) **LOW KEY POINT.** Check height and position; lookout; never use *full* airbrakes to let down in a *straight line*. Increase to approach speed 1.3Vs +Vw & re-trim (see AFM for recommended procedure);
4) **DIAGONAL LEG.** Monitor approach airspeed every 2 to 3 seconds; Adjust leg to compensate for sink/wind with care; Maintain lookout of all areas especially above & below. If low or in very strong winds, turn early onto base leg or angle in towards runway;
   Search for aircraft on opposite side of runway and/or on a long final approach
5) **BASE LEG.** Check airspeed regularly, landing area is free of obstructions; lose excess height with careful use of airbrakes; adjust leg ar required for wind; Make final good **lookout** to both sides for traffic opposite base leg or long final, also **behind**, **above** and **below**.
6) **FINAL TURN and APPROACH**

a) Demonstrate a well-coordinated and well-banked turn;
b) Close airbrakes before final turn in early flights; teach final turns post solo with airbrakes open if approach speed higher; never open the brakes when in the turn;
c) Lower the nose slightly as final turn is started;
d) Final turn is to be at about 30° of bank; don't start early;
e) Select a **landing line** on centre-line of the landing area, clear of obstructions; adjust line as soon as possible;
f) Maintain adequate speed e.g. especially avoiding a ***Pear Turn*** hazard;
g) Especially in strong winds; emphasize need to maintain correct approach speed. Monitor speed every 2 – 3 seconds; listen to the speed;
h) Aim to use airbrakes at ½ - ⅔ airbrake setting;
i) Be prepared to land long to clear other gliders/vehicles.
j) As WIND GRADIENT is traversed anticipate drop in the airspeed and increase in sink rate. Correct

promptly with nose down (airspeed), and close airbrakes (to reduce sink rate).

7) **RIGHT HAND CIRCUIT and COVERED INSTRUMENTS**

At about this stage fly a right hand circuit if not practised at the club. The student's instruments should be covered for part of a flight; limit this to upper air work. Beneficial if lookout or speed control are poor.

8) **DURING THE FLIGHT** and **POST-FLIGHT**

Monitor circuit, lookouts & follow through on the approach, flare and landing. Review the flight and circuit decisions, what to modify next time. Review also the hold-off and landing, plus other exercises.

THE CIRCUIT
Pt IV FLYING THE CIRCUIT - 2

1) **ZIGZAG on DOWNWIND DEMONSTRATION (Optional exercise)** Instructor to fly, at an angle of about 45º to the downwind leg, start before high key area; Ask student to judge when at correct distance and angle to the runway to start a normal downwind. Assess and explain the response and continue towards the airfield; Angle away from the airfield before the low key point, and repeat. This exercise to teach the **angle** to the runway, the **distance** to the landing area and the **height** all need to be continuously monitored. **NOTE**. Do NOT indicate the correct distance from the airfield. Only show the student that a selected position is too close or too far away, then continue the exercise. Student to make the decisions for normal circuit positions on subsequent flights.

2) **RUNNING OUT OF HEIGHT & ABBREVIATED CIRCUIT** exercise

a) This exercise is to be performed at any time after the student has started planning and flying the circuit.
b) Demo an abbreviated circuit if the student begins to run out of height before or in the circuit and arrives at a height of 500 ft. minimum before reaching the normal **low key point**.
c) Balance of circuit is to be flown with respect to a new reference point (it will be further up the runway than normal). Emphasise it is hazardous to try and fly a very low circuit. Always teach the student to have an alternative landing area selected. In cases of great loss of height the student is **free to land in any direction**.
d) On later flight, instructor deliberately reduce height; student to recognise situation requiring abbreviated circuit and then required to fly it.

3) **AIRBRAKES OPEN BEFORE THE CIRCUIT** exercise
This exercise is to be given when the student's circuit judgement is becoming very secure and consistent. Though stressful, it is a useful exercise to improve confidence. Land very abbreviated, or on another runway or downwind. This is perfectly acceptable. The instructor is to check for traffic and monitor flight closely, and if necessary close the brakes.

4) **POST-FLIGHT REVIEW**
Discuss SOAR options after flight such as if selected runway would have been blocked, sudden sink or tailwind gust (down burst), or traffic conflict on final. Note wind direction/speed changes since take off, and discuss effects of crosswinds on circuit planning.

TAKEOFF, AEROTOWING
& EMERGENCY PROCEDURES

Student take off and tow if this has been previously demonstrated – See note 1) at top of page 14.

1) **DEMONSTRATION;** student to follow through**.**
Start with ground run; large control movements; note position of tug in canopy for normal tow; keep tug in imaginary *sight* on canopy; show move to *low tow* and back. Maintain lateral position by coordinated use of stick and rudder; demo correct position in turns.

2) **TAKEOFF** and **AEROTOW**; Student has control.

a) If one wing hits ground on initial ground run, or directional control is lost (more than about 30 degrees), **release immediately**;

b) If glider gets low relative to the tug, a rapid climb into position can lead to a **slingshot effect** that causes the tug to be upset; this can be accentuated in a strong wind gradient. See also notes on Page 25.

** If at any time the glider should begin to climb rapidly or uncontrollably above the towplane, **release immediately**.

** Also if glider pilot loses sight of tug below nose of glider, **release immediately**. Both actions are to prevent a ***towplane upset*****.**

3) **AEROTOWING – High tow** is used for launching, **low tow** for cross-country towing.

a) Maintain position with tug in a *sight* on the canopy;
b) To maintain lateral position, use coordinated controls;
c) In turns, bank glider same as, in same path as towplane;
d) At ~1000 ft agl demo **Low-Tow**; return to high tow.

4) **RELEASING FROM TOW** (this check used after all releases)

Look to both sides, particularly to right, also search **above** then release, visually **ensure** rope has gone, call out "rope gone", then turn to right, adjust flying speed, raise wheel and visually check the placards or signs that it is up and locked, then re-trim glider and confirm location of the airfield.

5) **BOXING THE SLIPSTREAM** exercise.

Using coordinated manoeuvres move to side, go down to low tow beside slipstream, cross under slipstream to other side, return up the side and manoeuvre to behind the towplane. Alternatively first move down through the slipstream, then move to side, etc.

6) **SLACK ROPE** exercise

Instructor to develop slack in the rope during a turn. To remove the slack, yaw away from the rope as it becomes tight. If the slack is excessive, use the airbrakes carefully, and again yaw the glider and close the airbrakes as the slack is removed. Student to practice removing slack that is produced by instructor.

7) **EMERGENCY PROCEDURES ON AEROTOW** with **DESCENDING ON TOW**;
Fully pre-brief the tug pilot before this flight.

- If towplane waggles **rudder**, check **airbrakes** closed and locked;
- If towplane waggles **wings**, immediately pull the **release**;
- If glider cannot release, move to **left** and waggle wings. Towplane will return to airfield and release;
- If you enter cloud, release immediately and turn around to exit as quickly as possible;
- If both glider and towplane cannot release, do a formation landing.

a) At approx. normal release height gradually open the airbrakes; Note sound, and effect of airbrakes on climb.
b) After approx. 10 secs. the tug pilot will give the **check airbrakes are closed and locked** signal (rudder waggle); close and lock the airbrakes; the tug pilot will next fly straight & level;
c) Move into **low tow** position **–** note tug position relative to horizon;
d) Next, the tug pilot will descend at approx. 3 - 4 knots;
e) Use airbrakes first with care, if needed to keep rope tight; could also yaw glider;
f) After a stable descent has been flown, tug pilot will resume level flight; close and lock airbrakes, and return the glider to **high tow**;
g) Tug pilot will signal **release immediately signal** (rocking wings).

8) **ROPE BREAK PROCEDURES** exercise at ALTITUDE

This exercise should be performed at **altitude** several times before a simulated rope break or premature release is given during a tow. Student to fly; instructor prompting.

Motto: plan ahead.

a) From best L/D speed, raise nose to normal towing attitude;
b) As speed drops towards the 1*g* stall speed, call "recover" to simulate a rope break or a premature release where the pilot does not react promptly;
c) Immediately lower the nose to **below** the approach attitude and **wait**; start counting the time taken to reach a normal approach speed of 1.3 Vs + Vw minimum: Remember, from a slow airspeed it is vital to get the nose down after a break, to regain airspeed;
d) A turn may be started only when airspeed is adequate; when able, release rope or winch cable;
e) Repeat exercise several times before the rope break exercise is done low down. Always **fully brief** before any practice.

8) **ROPE BREAK** exercises after takeoff and at low heights.
Demonstrate each rope break first - student following through - then monitor closely practise by the student several times as follows:
   - Just after lift-off (**maintain attitude**, land straight ahead on the runway - avoid towplane by moving to the right as needed),
   - at a low height that allows a safe landing on the runway ahead,
   - At a height to allow a safe downwind return to the runway, and
   - At a height that allows an abbreviated circuit.

a) Warn towpilot and **fully brief student**; if unsafe, don't practice;
b) When rope breaks, first lower nose to maintain or **increase** speed to a safe speed for manoeuvring, use pre-planned actions; if just above the runway, maintain attitude, then adjust for touchdown and open airbrakes very carefully;
c) If rope breaks below 300' agl, regain approach speed, then plan to land straight ahead; if speed and height are adequate for manoeuvring, use SOAR technique to choose safest Option for an emergency landing (possibly a controlled crash landing ahead).

d) If rope breaks above 300' agl, regain speed then assess Situation. Land downwind if headwind less than 10 knots, or fly abbreviated circuit if height is adequate; when landing downwind select a new reference point on the part of runway closest to the approaching glider. **See also p. 41** for additional decision-making notes.

NOTE on **TOWPLANE UPSETS** – see item 2) b) on p. 22.
An uncontrollable and fast upset (2 – 3 sec) of the tug can occur during the initial climb after takeoff; several factors make this more likely:

- Use of c.g. hook on glider or low hook location,
- Strong wind gradient,
- Rapid initial climb by the tug, leaving glider low and behind,
- Glider then **over-rotating** rapidly in attempt to catch up to the tug,
- The elevator authority of the tug and glider could be exceeded, leading to a diverging **slingshot**, with no recovery possible.

This last effect can occur with e.g. a glider with a low hook location relative to the centre of drag, giving a positive nose up moment from the rope pull. If the glider is over-rotated the effect can over-power the elevator authority.

The effect may also be seen with a heavy water-ballasted glider. The wings bend with the load, raising the *cg*, and the rope pull could give an acceleration to the glider with a strong nose up moment; this effect can overpower the elevator also in this case, even with the stick fully forward!

WINCH LAUNCHING

Go through CISTRSCO checks as usual, search area above and ahead for other traffic, and ensure runway is well clear of hazards.

1) On first **demonstration** launch, instructor flies, student following through; on next launches student is given increasing control.

2) **TAKEOFF**

a) As glider starts to move keep wings level, attitude normal; with off-centre *cg* hook, and in crosswinds apply appropriate rudder;

b) If one wing drops to hit the ground, **release immediately**;

c) Use rudder to steer on the ground; forward stick pressure may be needed to prevent rapid rotation into full climb on some older gliders.

d) Rotation rate should not exceed 6°/second.

3) **INITIAL CLIMB —** below 150 to 200 ft agl.
Allow glider to climb gradually to about 200 ft agl at minimum speed, Vs + 10 knots; monitor airspeed closely.

4) **FULL CLIMB —** above about 200 ft agl.

a) Allow glider to rotate gradually to full climb attitude; but check airspeed is adequate before rotating. Continue to monitor speed;

b) If launch is too slow, give TOO SLOW signal (Lower the Nose);

c) If too slow persists, decrease rate of climb to reduce load on winch;

d) If speed does not increase, release and lower the nose immediately;

e) If launch is too fast, give TOO FAST signal (Yawing motion);

f) If porpoising occurs, briefly reduce stick backpressure.

5) **LAYING OFF FOR DRIFT**
If launch is out of wind, steer glider toward the wind with coordinated controls.

6) **RELEASING**
At top of launch, lower nose to descending attitude, pull release, adjust airspeed, raise wheel as appropriate; re-trim. Assess height then cross check against altimeter, and look around before turning.

7) **WINCH LAUNCHING EMERGENCY PROCEDURES**

Motto: plan ahead

a) If glider overruns cable on the ground, release immediately, shout "STOP", keep nose firmly down and open airbrakes;
b) If one wing drops to the ground, **release immediately**;
c) If cable breaks, immediately lower nose to speed up to normal **approach** speed, then pull release. Do NOT open airbrakes;
d) At very low heights land straight ahead. Use airbrakes normally;
e) Between 150 ft agl and 300 ft agl, lower-nose as before, pull release, and assess height. Land straight ahead normally, or turn across wind to use up height, then turn to land into wind;
f) Above 300 ft agl, lower nose as before; pull release, assess height; land at upwind end of field from extended base leg, or fly an abbreviated circuit. Do NOT attempt to land at launch point if low;
g) Gradual power loss by winch - difficult to notice. Treat this as a symptom of an emergency and lower the nose;
h) If cable won't release, winch will cut cable with guillotine. Start spiralling descent at higher than normal airspeed; land into wind.

8) Student approach, land, instructor monitor as required.

9) **Review** the launch, and comment about planning ahead for an **interrupted launch**, the emergency actions and plans to recover and land. Also review other exercises such as circuit planning, it's flying and the approach, flare, the hold-off and landing; and what to modify next time.

10) **CABLE BREAK PROCEDURES** exercise at altitude (above circuit height)

This exercise should be performed at height several times; instructor demonstrate first, then the student to fly with instructor prompting. The objective is to get the recovery procedure ingrained in the student as an automatic reaction before a simulated cable break is given.

Motto: plan ahead.

a) At altitude, dive slightly to increase speed to approximately 70 knots, then raise nose to a normal winch climb attitude of approximately 40^{o} nose up;
b) As speed drops through about 45 knots, call "break"; this is to simulate a cable break;

c) Immediately lower the nose to below the approach attitude and **wait**; start counting the time taken to reach a normal approach speed of 55 knots minimum;
d) Repeat exercise several times, incl. other flights. Count the time taken to attain the above safe approach and manoeuvring speed, and before the cable break exercise is performed on a winch launch low down.
   - Always **fully brief** before any practice.

11) **CABLE BREAK** exercise from *failed* launch

This exercise is to be practised more than once:

- just after liftoff (**maintain attitude** and land straight ahead on runway),
- at a low height that allows a safe landing on the runway straight ahead,
- at a height from which a safe downwind return to the runway is possible (min. 300 feet above ground), and
- at a height that allows an abbreviated circuit.

a) Warn winch operator and **fully brief student** — if any traffic hazards exist, don't practice;
b) When cable breaks, first lower nose to **regain** approach speed (and then pull release), start planning; then, if just above the runway, adjust attitude for touchdown and only open airbrakes very carefully;
c) If cable breaks below 300 ft agl, and at a slow speed, lower nose to below approach attitude to regain/maintain speed then plan a landing straight ahead on the runway;
d) If cable breaks above 300 ft agl, regain speed then turn away from the wind, assess **S**ituation. Look at **O**ptions, then act on best option; Land at the upwind end of the runway, into wind if space permits or downwind on runway if wind less than 10 knots, or fly abbreviated circuit; **see also p. 66** for additional notes.

This page for Notes

STEEP TURNS
& ADVANCED THERMALLING

1) **ROLLING IN**
a) Perform good LOOKOUT for other aircraft to both sides and **above** to the front, then increase speed to that required for the steep turn (45 to 60° angle of bank);
b) Look over the nose to a point on horizon, then roll with a coordinated turn entry, to desired angle of bank.

2) **STAYING IN**
a) Control angle of bank by reference to horizon straight ahead; keep yaw string (and ball) centred;
b) Control speed by keeping pitch attitude constant using elevator normally. Notice extra backpressure needed to do this. Re-trim in the turn;
c) Keep looking ***up*** (and hence along the horizon) to maintain an adequate lookout in the direction of turn;
d) If speed seems difficult to control, reduce bank, re-adjust speed, and then resume steep angle of bank.

3) **ROLLING OUT**
a) Look ahead and under **high wing** for other aircraft,
b) Roll out and notice nose will tend to rise; counteract this with forward stick pressure, and re-trim when straight and level.

4) **FAULTS** in **STEEP TURNS**
a) Failure to adequately increase speed before starting the turn;
b) Failure to adequately look out – including under the high wing – before rolling into and out of the turn;
c) Tendency to enter too quickly;
d) Tendency to allow bank to increase – some aileron may be needed to *hold off* the bank;
e) Failure to apply adequate *back pressure* to the stick to control speed in the turn;
f) Initial attempts at steep turns should be limited to less than one revolution before resuming a more normal medium turn;
g) Tendency to look down into the turn instead of along the horizon.

See also faults in medium turns on page 12.

ADVANCED THERMALLING exercise

In this technique, steep turns for approximately three quarters of a full circle are required.

a) As the glider is circled in a thermal at a medium angle of bank, watch for increase in climb rate, or the area of strongest lift;
b) When the glider flies into the strongest lift, pick a reference point well ahead, and simultaneously increase angle of bank to that of a steep turn;
a) Keep adequate lookout, and note a definite back-pressure on the stick is needed to control the speed;
b) Continue steep turn for 270 degrees of a circle, i.e., until the reference point is in line with the lower wing tip;
c) Then resume the medium angle of bank;
d) Repeat the manoeuvre until the thermal is centered;
e) Mixing the earlier technique (page 13) with this technique may be found more advantageous if you are flying in sink for most of the first circle or two.
f) **Review** how to safely **enter** a thermal with other gliders, also **collision avoidance** techniques, see Notes below – and rules of the air.

6) Student to plan and fly the circuit, instructor to monitor and prompt with comments as appropriate. Closely monitor the approach (from normal final turn height), the flare and landing.
7) Review the flight, starting with the circuit, approach and landing, then review the steep turns exercise, and any thermal flying.

NOTES to instructor on COLLISION AVOIDANCE

At any time, point out other aircraft and discuss how to predict their intentions: Will the glider join the thermal, or go to land? Is the jet descending onto a collision course?

Discuss how best to avoid a collision conflict and how to keep adequate spacing, e.g. when thermalling. The greatest hazard is another aircraft at the same height, which is apparently not moving with respect to a point on the canopy, but is getting larger, not necessarily flying in straight lines. This is on a collision course!

Also beware of gliders **above** when entering a thermal. Stay clear of major airports, airways and the approaches to active runways. Extra care is needed to see and avoid, and to maintain a very good lookout.

SPIRAL DIVES & FURTHER STALLING

1) **SPIRAL DIVE.** Aircraft is not stalled, speed increases.
a) Carry out CALL check, then enter spiral dive from a steep turn; as nose drops and speed increases, try to reduce speed;
b) Spiral tightens and speed increases - this is the SPIRAL DIVE. Note increasing speed and *g* loads, also effectiveness of controls;
c) Spiral dives can also start, e.g. from a **spin attempt**. In this case it is important to recover quickly, with the student recognising the differences in spins/spirals.
2) **RECOVERY** from **SPIRAL DIVE**
a) First reduce *g* loads; level wings with coordinated controls; do not deflect both controls fully at same time;
b) Pull out of dive gently.
3) **BENIGN SPIRAL** – A steady descending spiral to lose height rapidly. Start with CALL check.
a) In a well coordinated turn, re-trim to fly hands off;
b) Slowly open the airbrakes fully and monitor the descending turn but with hands and feet off the controls; note sink rate;
c) The glider remains close to the original angle of bank and airspeed; after a steady descent, resume normal flight.

FURTHER STALLING exercises: These exercises are designed to enhance the student's understanding of the 1*g* and accelerated stall conditions. Emphasise stall avoidance, not the stall itself.

- Perform exercises when students are comfortable with 1g stalls;
- Clearly state what kind of stall is required;
- Watch power pilots closely when first introducing these exercises.

4) **ACCELERATED STALL** while **CLIMBING** exercise
a) Increase speed slightly then pitch the glider up to a climbing attitude of about 30°; maintain climbing attitude;
b) As speed decreases some symptoms may be absent or not obvious;
c) At the stall, even with stick fully back (note this by touching stick against the stop) nose drops sharply;
d) To recover, *lower the nose*, even with nose already going down;
e) As speed increases use controls normally to ease out of the dive:

f) Repeat the above but recover immediately the first symptom of the approaching stall is noticed. This action is to prevent a stall;
g) Emphasise ineffective elevator at the stall; pilot must unstall the wings first, then the nose can be raised.

5) **ACCELERATED DESCENDING STALL;** CALL check
a) Increase speed to 55-60 knots then pitch up about 30º;
b) When nose stops pitching down, pull back abruptly and fully on the stick too soon and again emphasise this to the student;
c) Note buffeting and high sink rate; glider is fully stalled in a distinct nose-down attitude and at higher speed; note ASI reading;
d) Note glider accelerates rapidly when recovery action is initiated.

6) **ACCELERATED STALL** in a **TURN**; CALL check
a) Enter a turn at approx. 30º angle of bank and begin to reduce speed;
b) Note the unusual control positions needed to control the turn;
c) At the onset of the pre-stall buffet note the airspeed – compare to the 1g stall speed;
e) At the full stall, recover as for wing-drop stall;
f) Repeat but immediately the pre-stall symptom(s) is noticed recover - "lower the nose". This recovery action is to prevent a stall.

7) **EFFECT OF ANGLE OF BANK ON STALL SPEED**
a) Instructor demonstrate; student observe and call out the airspeed when s/he detects the pre-stall buffet at each angle of bank;
b) Start with wings level, and slow only to the pre-stall buffet; student call out speed, instructor recovers;
c) Increase speed and repeat above at 20º, 40º and 60º (2g) angles of bank. Note the increase in stall speed with bank angle is not linear. * Typical increases are 1 knot at 20º, 6 knots at 40º and 12 knots at 60º angles of bank assuming a 1 g stall speed of 32 knots.
d) Student plan circuit, making own decisions; instructor monitor.

Note as the angle of bank increases so does the *g* load and the loads on the aircraft; therefore use care when rolling to wings-level flight. [A common fault of instructors is not maintaining *g* loading in the turn, glider tends to spiral and lose height rapidly as speed increases].

9) **POST-FLIGHT REVIEW –** don't forget**!**

SIDESLIPPING

1) **SIDESLIP at ALTITUDE**; student flying, CALL check.

a) From a coordinated turn at approx. 30º angle of bank, note the angle of bank and pitch attitude desired for the sideslip;

b) Initiate sideslip; note glider's track, rate of descent, inaccurate ASI;

c) First teach entry and recovery from sideslips in a turn;

d) Next pick a reference line on the ground; as glider turns towards this line, apply rudder to stop the turn to track parallel to this line.

NOTE: A sideslip also can be entered by:

- Applying bank and yaw together from wings level;
- First banking glider - adverse yaw starts slip; then apply rudder;
- Yawing first, then banking the glider.

Practise above techniques before first solo, with and without airbrakes; Also practice sideslip to counteract drift; note small angle of bank.

2) **SIDESLIP to COUNTERACT DRIFT** exercise

a) Perform first at altitude using reference line at 90 º to the wind;

b) Maintain aircraft heading on runway centreline, note shallow sideslip angle needed on approach in x-wind;

c) Ease off the bank close to the ground for good wing-tip clearance.

3) **SIDESLIP to INCREASE RATE of DESCENT on APPROACH**

When sideslipping on approach, set speed = 1.3Vs + Vw as before.

a) Set up sideslip by yawing away from the runway, the glider's track will then be along the runway centre-line (called a *forward slip*);

b) If there is a crosswind, lower the into-wind wing;

c) Recover with adequate height (a min. of 100 ft agl).

4) **SLIPPING TURN prior to LANDING** exercise

As sink rate can be very high, practice first at height.

7) **FAULTS IN SIDESLIPPING**

a) Banking the glider too much, i.e. running out of rudder authority; the glider turns;

b) Poor speed control when ASI is unreliable by not maintaining the pitch attitude, e.g. allowing the nose to drop;

c) Poor understanding of functions of the controls to enter a sideslip; return to practising entering into and coming out of the sideslip from a well coordinated turn at altitude.

TAKEOFFS and LANDINGS in CROSSWINDS & ILLUSIONS CREATED by DRIFT

1) **TAKEOFF in a CROSSWIND** - Towplane can be placed slightly to downwind side of glider; sideways pull in rope helps prevent **weathercocking** of glider and helps keep tug straight.

a) Use rudder to keep straight, aiming at the tug, as much as possible;
b) Hold upwind wing slightly low during ground run;
c) Keep glider on ground until airspeed is adequate, then allow glider to lift off;
d) After takeoff stay in line with towplane, or crab into wind to avoid hazards at edges of field.

2) **LANDING ACROSS the WIND — by CRABBING**

a) On FINAL crab into wind to stay on course along runway centreline, avoid slip or skid; keep yaw string straight;
b) During hold-off and just prior to touchdown straighten glider with rudder to head along runway, and lower into-wind wing slightly; steer on ground with rudder as before.

3) **LANDING ACROSS WIND — SIDESLIP METHOD**

a) Slip into wind as required, to line up with runway;
d) Keep wing slightly low throughout flare, hold-off and touchdown; then keep straight with rudder. **NOTE**: Keep straight and wings off ground as long as possible, use wheel brake with caution on gliders with c.g. aft of wheel, to avoid ground-looping tendency.

4) **ILLUSIONS CREATED BY DRIFT** - Demonstrate in strong winds.

a) Note apparent skid caused by drift, most noticeable at low heights;
b) Note drift when in circuit, especially on diagonal and base legs; resist temptation to remove drift by using too much rudder (spin possible) during final turn; and keep yaw string straight!
c) Stress the need for adequate speed, and well-coordinated and well-banked FINAL turn.

5) **POST-FLIGHT REVIEW**

In strong winds students to observe others in the circuit to provide useful clues for their takeoffs and circuits. Immediately after takeoff in a crosswind, take control to debrief the student's takeoff. Debrief balance of flight after landing.

SPINS

1) These exercises should be done from high tows. Recovery height must be above 2000 ft agl min., starting from at least 3000 ft agl. C.G. must be within limits. A lightweight pilot to add ballast that is adequately secured for under **all** conditions, incl. **negative-*g*** loads.

2) **APPROACH TO A SPIN** exercise; perform CALL check

b) Gradually slow down from a gentle/medium turn; notice symptoms of stall, but that the turn *looks* normal;

c) If one wing does not drop at stall, yaw aircraft slightly to induce the lower wing to drop;

d) As wing drops, autorotation will start as a prelude to a full spin;

e) To recover, immediately lower nose to un-stall the wings. As speed returns, level wings normally (stick and rudder together) and ease out of the dive. Note height lost in the recovery.

3) **FULL SPIN** from under-banked & over-ruddered turn

a) Perform CALL check; enter spin from *normal* coordinated turn by allowing speed to gradually reduce - spin should start from what appears to be a normal attitude; point this out;

b) Hold-off bank as needed, slowly approaching stall speed; this reproduces the **slow final turn**; mention this point;

c) Before the full spin develops, one wing will drop and autorotation will start to yaw the glider and the nose will drop, try to keep it up with the elevator - next it will roll into a full spin;

d) Hold controls to maintain full spin;

e) Point out constant speed (and that the glider is stalled), the constant *g* force, also rapid spinning descent and high rate of sink.

4) **RECOVERY from FULL SPIN** (check AFM for correct procedure for type)

a) First apply **full** rudder against the direction of rotation, and centralize the ailerons;

b) PAUSE (half to one second may be implied in other manuals);

c) Move stick steadily forward to un-stall the wings; a firm *push* against the elevator forces may be necessary;

d) As spinning stops, centralize the rudder; look **up**, and pull out of the dive using controls normally;

e) If speed increases excessively, start the pull up earlier, or be more vigorous in the pull up.

5) **SPIN ATTEMPT** but glider enters **SPIRAL DIVE;** perform CALL check;

a) Repeat the above spin demonstration as in 3) above, but allow the glider to transition into a **spiral dive;** point out increasing speed and increasing *g* loads;

b) **Recover from spiral dive** – relax stick back pressure to reduce *g* loads, level wings normally then pull out of the dive.

6) **FURTHER SPINNING** exercises (15 scenarios) – These spin exercises are designed to provide the student with more complete knowledge of the glider's handling and spinning characteristics, and to better enable spins to be *avoided* in the first place.

a) **Changing Effect of Rudder at the Stall** – misuse of rudder at the stall causes a spin;

b) **Spin to the left off a right turn**; and vice versa; start from under-banked turn;

c) **After Launch Failure**, from attempt to turn at normal gliding attitude after rope or cable break, when pilot tries to initiate turn, and adequate speed has not been re-established;

d) **The Pear Turn**; rapidly tightening FINAL TURN at normal speed after overshooting runway centreline;

e) **In a Thermal**; Similar to the Pear Turn, a spin can also occur in a thermal when the turn is tightened suddenly in stronger lift without first increasing the glider's airspeed.

It is vital in all these situations to be able to recover before the full spin stage is reached. The two situations, c) and d) are the more critical as they usually occur very low down.

Explain that tightening a final turn or trying to thermal tightly low down with inadequate airspeed, is likely to result in a spin that cannot be recovered from before hitting the ground. Hence in any low-height situation, if the wing starts to drop the recovery action must be to unstall the wings as quickly as possible, and then to level the wings normally when flying speed is regained.

7) Student to plan and fly CIRCUIT, making own decisions.

8) **REVIEW** the flight, referring as needed to the Student Manual *SOAR and Learn to Fly Gliders*.

OFF-FIELD FIELD SELECTION & CIRCUIT PLANNING

The selection and planning of circuits into strange fields is an essential part of becoming a competent and safe pilot – to show that going solo is the beginning of better things to come!

These flights provide essential practice for a student before a first solo flight, but under supervision. They will show whether the student remains calm under the increased workload, realising that if they get out of range of the club when first flying solo, the workload and stress levels can increase to the point at which the pilot may panic and make poor decisions.

The student should perform these exercises with the instructor providing feedback or mentoring advice as appropriate. The exercises may be varied over a wide range of situations, and may be flown equally satisfactorily with or without thermals.

1) **GROUND INSTRUCTION & PRE-BRIEFING**

Set the scene before the flight, with a thorough discussion of off-field landings, to include decision heights, inspecting of suitable fields, types of field, field surfaces, selecting a circuit to fly, hazards on the approach, etc. Refer also to *SOAR and Learn to Fly Gliders* for more of these details. Agree now that the instructor will make the decision to return to the club's airfield to land.

2) **AIR INSTRUCTION**

Towards the end of a flight, select an area adjacent to the airfield.

a) Start at a height such as 1500 ft. agl, and ask the student to identify a suitable field in which to land;
b) After a field is agreed, the student is to plan a circuit, including an alternate landing area, identifying hazards on the approach.
c) Debrief quickly, then go to another area and repeat the above. **TAKE CARE** that a safe return to the club airfield can be made.

3) **POST FLIGHT DEBRIEFING**

Point out the need to make decisions by the pre-defined heights and that thermalling really restricts the view of any field below. Discuss good and poor decisions regarding choice of field and the planning of the circuit into it, and the need to choose an alternate landing area for any choice of field. To further confirm the choice of field go with the student by car to look at the approach to and the surface of the chosen field and any alternate landing area.

PRE-SOLO FLIGHTS

Two or three flights are a suggested minimum. Use the Association **RECOMMENDED SOLO STANDARD for GLIDER PILOTS** as a guide for assessing the student's flying and judgement skills before first solo.

1) Before solo ask a different instructor to fly with your student to evaluate skills and readiness to solo;

2) For a minimum of two flights prior to solo, student must not need prompting or assistance of any kind at any stage of the flights;

3) On these flights review any exercise student wishes, but don't rush or **overwork** the student just prior to solo.

4) **GENERAL REVIEW**

a) Adequate checks: CISTRSCO, Post Release, CALL, SWAFTS;
b) Adequate lookout: Prior to release, prior to turns, during thermalling, in circuit and prior to landing;
c) Review reasons for spin training – too slow final turn and too much rudder; also ***Pear Turn***, and low launch-failure scenarios;
a) Review cable-break procedures, and aerotow emergency signals;
b) Review collision-avoidance techniques and need to stay very alert close to controlled airspace, airports, etc;
f) Give student the pre-solo exam, and sign the training record when they pass the exam.

5) **PRE-SOLO and SOLO FLIGHTS**

a) Normal instructor fly ***as passenger*** with student; then send student solo;
b) Monitor the solo flight, and debrief the student following the flight;
c) Keep tabs on your students and ensure they have regular dual flights before licensing, to monitor their progress and to teach more advanced items – including radio use, airspace structure, more spin-avoidance practice, thermalling, collision avoidance, review field selections and off-field landings, and so on.

POST-SOLO FLIGHTS

It is **important** to remember that student pilots may only fly under the supervision of an instructor, even when solo. This is easily ensured at most clubs where a **duty instructor** is present during flying. Your students will be flying sometimes when you are not there, so it is an excellent morale booster if you follow up when you can with the students that you taught, to ask about how they are doing.

There are a number of exercises that newly soloed pilots should be practising regularly prior to their licence check flights. This is where you, the instructor, can assist in giving them the encouragement they need, and to help with defining an objective for each flight.

Early solo flights should concentrate on practising coordination in turns, lookout techniques, and becoming comfortable with flying slowly and doing stalls and recoveries. Accuracy in flying the circuit together with good speed control and approaches with ½ - ⅔ airbrake setting, for example, are good objectives to suggest to the student. Later flights should include thermalling practice and other advanced exercises such as sideslips, spins, and steep turns. Spins and spin-avoidance exercises should be watched from the ground.

These flights should be interspersed with dual flights during which exercises such as spins and sideslips should be reviewed. Also show the student more advanced thermalling techniques, for example.

Transition to solo aircraft after sufficient experience solo in dual aircraft should be briefed by instructor familiar on type and be supervised visually by instructor on the radio for first couple of flights to provide assistance. Approach/landing phase critical.

The **Bronze** Badge defines an excellent set of tasks that can be the basis for consolidating important exercises such as field selection and off-field circuit planning. Collision avoidance and the correct use of radio and the airspace around terminal areas also should be reviewed at this time. Such tasks can be very usefully covered during otherwise poor weather when thermal flights are not possible.

Circuit planning, good lookout and airmanship, use of the SOAR technique and quick but thorough performance of all checklists should be audited on each flight.

THE SOAR TECHNIQUE

The following example shows how this decision-making technique is used after an interruption to a launch. Similar steps are taken for other situations encountered before and during flying.

During the CISTRSCO checks, decide whether or not you would attempt a downwind landing under the prevailing conditions. If the launch is interrupted **at a height of less than 300 feet above ground,** lower the nose immediately and land straight ahead (if very low to the runway, take care when lowering the nose). It is dangerous to attempt to turn around to land on the runway when ***very*** low, so your first choice should be this ***automatic reaction***.
If the launch is interrupted at about 300 feet you may use your Pilot Decision-Making abilities to make a safe landing. Assess the **S**ituation. What is the actual height, airspeed and the position of the glider relative to the runway, and what is the wind direction and speed?
Next consider your **O**ptions. For example, what will happen if you start a turn with adequate speed? Is there a possible landing area to the side and what is its surface like? What would happen if the turn were to be continued? Would it be safe to land on the runway?
Choose the safest option and **A**ct quickly, as there is not much time for hesitation.
Now **R**epeat the process. Is there still sufficient height to continue the turn, for example, and is the airspeed still safe for the conditions? If not, immediately act to correct it, and assess new options. Then act on the safest option, and repeat the process.
Notice that the automatic reaction to a low-level emergency can be modified safely by good judgement. The PDM or pilot decision-making technique, using the mnemonic **SOAR**, is shown being used above, to safely modify the normal automatic reaction to this emergency.

Use of the SOAR technique does not reduce the need to cover all Options during the pre-takeoff CISTRSCO checks. This will substantially reduce the time for decision making when the launch is interrupted. By having all options covered, pilot stress is also reduced, an important safety consideration when good flying is needed. See also advanced SOAR technique using P^3 (Perceive, Plan, Perform).

NOTES
Risk Management and PDM

CISTRSC-**O** for **OPTIONS**

Are you ready to "WROLL"?

Wind – speed and direction. Calculate approach speed and direction of low level turns into wind.

Release – pilot initiated top reasons (lose directional control, wing drop to ground, over running rope, slack in rope before lift off, power loss, obstacle presented, not airborne by normal point, canopy opens, lose sight of tow plane or too out of position, and any safety concen).

Obstacles – left/center/right, fixed or moving.

Landable Areas - left/center/right, ask if not familiar with location.

Launch Interruptions – low level plan straight ahead with small turns to clear obstacles,
after 300' AGL add option to make 180º turn . After 500'add option to make a modified circuit.

SOAR risk assessment and Pilot Decision Making & P^3
(Perceive, Plan, Perform)

Situation - What just happened?
What is happening now?
What is going to happen next?
Factors: Pilot, Aircraft, enVironment, External (PAVE) the way ahead!

Options – Consequences, Alternatives, Reality, External factors (CARE)
Take CARE to find Unintended consequences!

Action – decisions for risk management by the TEAM: Transfer,
Eliminate, Accept, Mitigate (TEAM)

Re-assess the situation.

Human Factors

Important to integrate into stages/training over the flights towards solo:

IAMSAFE (Illness, alcohol, medications, stress, alimentation, fatigue, emotions)

Vision (near vision myopia, bright/blue sky myopia, cone of acuity 2º, blind beyond 20º, detection of movement (saccades), max scan rate 100º/sec & scan technique.)

Inner ear effects (head position, otoliths, coreolis effect)

Low g sensations (spatial disorientation, air sickness)

Stress reactions (heart rate (effect on cognitive, tunnel vision, mental shut down, physical shutdown) use SOAR and stress inoculation.

Mental fixations (where you look tends to control where you go, loss of situational awareness/focus, distraction.

Control errors (feel & movement, air brake misuse, seat position/cushions, landing gear cycle)

Airmanship (attitude/knowledge/skill, confidence, responsibility, judgement)

Pre-Flight briefing (1-2 minutes max)

- Confirm Preparatory ground instruction completed for stages o
- State what will be covered (major teaching points)
- State where it fits into curriculum
- State why it is important
- Cover any Human Factor relevant to lesson
- Cover any safety points relevant to lesson
- Ask for any questions

In Flight Analysis and Development

- Observe students inputs on controls (rudder pedals and stick) not just what aircraft does
- Note head position for look out
- Allow quiet periods for student to absorb information
- Give positive feedback
- When explaining new material instructor flies aircraft
- Make note of any Human Factors points for debriefing after flight
- Make note of any safety points for debriefing after flight

Post flight Debriefing (2-3 minutes)

- Ask how flight went from students perspective
- Mention 1-2 faults to work on and how to develop skill required
- Discuss any HF or safety lessons learned
- State what student did well
- Ask for questions
- Suggest what should be next exercise(s) and make notes in PTR
- Leave flight lesson on positive note!